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IS 10000-8 (1980): Methods of tests for internal combustion engines, Part 8: Performance tests [TED 2: Automotive Primemovers]

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IS : 10000 (Part VIII) - 1980
(Reaffirmed 2006)

Indian Standard

METHODS OF TESTS FOR INTERNAL COMBUSTION ENGINES

PART VIII PERFORMANCE TESTS

1. Scope — Specifies the method of conducting performance tests on constant speed and variable speed internal combustion engines.

2. SECTION I — Performance Tests for Constant Speed Engines

2.1 *Initial Performance Test* — The test shall be carried out on an engine as being offered to the user All parts shall be stocked The engine shall have been well run-in The period of running in shall be specified by the manufacturer In case it has not been run-in it shall be run-in as indicated by the manufacturer and this shall be subject to agreement between the manufacturer and purchaser or inspecting authority

2.1.1 The grade of lubricating oil used during test shall be as specified by the engine manufacturer In general, the operating temperatures and the lubricating oil pressure, during test, shall be maintained at values recommended by the manufacturer

2.1.2 Unless otherwise specified, the engine shall be tested either at the manufacturer's works or at an approved laboratory for output, overload capacity, fuel consumption and governing in accordance with IS : 10000 (Part IV)-1980 ' Methods of tests for internal combustion engines Part IV Declaration of power, efficiency, fuel consumption and lubricating oil consumption ' and IS : 10000 (Part VII) - 1980 'Methods of tests for internal combustion engines Part VII Governing tests for constant speed engines and selection of engines for use with electrical generators'

2.1.3 The following tests shall be carried out.

a) *Twelve Hour Rating Test*:

  i) *Engine of IS Rating A* — Eleven hours of continuous run, at rated full load at the rated speed to be followed immediately by one hour run at 10 percent overload as specified in IS 10000 (Part IV)-1980

  ii) *Engine of IS Rating B* — Twelve hours of continuous run at the rated speed and rated full load without subjecting the engine to any overload as specified in IS 10000 (Part IV)-1980

b) *Fuel Consumption Test* [see also *IS 10000 (Part IV) -1980*] — It shall be carried out only after the rating test has been carried out After the stabilized working condition has reached, the various parameters given in Appendix A of IS : 10000 (Part VI)-1980 ' Methods of tests for internal combustion engines Part VI Recording of test results' shall be recorded by gradually loading the engine Starting from no load, the various observations shall be made at the following load settings

  no load, 20 percent, 40 percent, 60 percent, 80 percent, 100 percent and 110 percent (*in case of engines of IS Rating A only*) — *all as percentage of rated load*

  These test measurements shall be carried out at intervals of 30 minutes and a graph shall be drawn

c) *Governing Test* [see *IS : 10000 (Part VII) 1980*]

2.1.3.1 Fuel consumption test and governing test shall be carried out only after the twelve hour rating test has been completed The sequence of fuel consumption test and governing test may be interchanged depending on the convenience for testing

2.2 *Final Performance Test* — The final performance test shall be conducted after the endurance tests specified in IS : 10000 (Part IX)-1980 ' Methods of tests for internal combustion engines Part IX Endurance tests '. The method of conducting the final performance test shall be same as that of the initial performance test in **2.1**

Note — In case the engine has already been type approved [*see* IS : 10000 (Part I) 1980 ' Methods of tests for internal combustion engines Part I Glossary of terms relating to test methods], the final performance test cannot be carried out as endurance test is not to be conducted again on such engines

Committees Internal Combustion Engines Sectional Committee EDC 14, and Methods of Test and Codes of Practice for Engines Subcommittee, EDC 14 : 3
[Ref Doc EDC 14 (3129)]

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2.3 The specific fuel consumption shall not exceed by more than 5 percent of the value obtained during the final performance test after the rating test (*see* **2.1**).

3. SECTION II — Performance Tests for Variable Speed Engines

3.1 *Initial Performance Test*

3.1.1 *Test procedure* — The performance of the engine shall be assessed by drawing a power curve over normal full load speed range. Readings shall be taken at a minimum of six approximately evenly spaced settings after stable conditions are reached over the normal speed range from maximum rated speed at full load to 45 percent of this speed or 1 000 rev/min, whichever is lower. At all these points the fuel pump shall be set at its maximum fuel delivery stop.

3.1.2 Test parameters shall be recorded as required on standard data sheet shown in IS : 10000 (Part VI)-1980.

3.1.3 The performance data shall be presented in the form of graphs recording power output, torque, specific fuel consumption and smoke density duly corrected according to the procedures specified in IS : 10000 (Part IV)-1980 and IS : 10000 (Part X)-1980 ' Methods of tests for internal combustion engines: Part X Tests for smoke levels, limits and corrections for smoke levels for variable speed engines ' and shall be recorded against the engine speed shown in the Appendix D of IS : 10000 (Part VI)-1980.

3.2 *Idling Test* — With engine at the working temperature specified by the manufacturer, it shall be ascertained if the engine idles satisfactorily for at least five minutes.

3.3 *Acceleration Test* — With dynamometer set for speed giving the maximum brake power at full throttle, the engine shall be accelerated abruptly from idling to full throttle. The engine shall pick up the speed easily. This test shall be carried out three times.

3.3.1 The acceleration test in **3.3** shall be repeated with the dynamometer set for 40 percent of maximum speed. This test shall also be carried out three times.

3.4 *Speed Limiter (or Governor) Check* — The speed limiter or governor shall be checked for the high idling speed specified by the engine manufacturer.

3.5 *Final Performance Test* — The test shall be carried out after the 100 hour tests specified in IS : 10000 (Part IX)-1980.

Note — In case the engine has already been type approved [*see* IS : 10000 (Part I)-1980] the final performance test cannot be carried out as 100 hour test is not to be conducted again on such engines.

3.5.1 *Test procedure* — The method of conducting the final performance tests shall be same as that of the initial performance test in **3.1**.

3.5.2 *Test results* — The performance tests data shall be presented in the form of graphs recording the corrected power, corrected torque, corrected specific fuel consumption and corrected exhaust smoke density as shown in the Appendix D of IS : 10000 (Part VI)-1980.

3.5.3 The corrected power and torque throughout the running speed range shall not drop by more than five percent from the corresponding initial performance test values.

3.5.4 The corrected specific fuel consumption shall at no point throughout the running speed range increase by more than five percent from the corresponding value obtained during initial performance test.

3.5.5 The corrected exhaust gas opacity shall at no point in the running speed range exceed the limiting values given in IS : 10000 (Part X)-1980.

EXPLANATORY NOTE

The testing and performance of constant speed and variable speed *internal combustion* engines was earlier covered by the following Indian Standards:

i) IS : 1600-1960 'Code for type testing of constant speed internal combustion engines for general purposes',

ii) IS : 1601-1960 'Performance of constant speed internal combustion engines for general purposes',

iii) IS : 1602-1960 'Code for type testing of variable speed internal combustion engines for automotive purposes', and

iv) IS : 1603-1960 'Performance of variable speed internal combustion engines for automotive purposes'.

These standards were originally issued in 1960 and as a result of implementation of these standards by the manufacturers of engines and testing laboratories, as also the operation of ISI Certification Marking Scheme, these standards have now been extensively revised

While IS : 1600 and IS : 1602 covered the codes for type testing of constant and variable speed engines respectively, the performance requirements of such engines were covered by IS 1601 and IS : 1603 respectively These standards are replaced by two sets of standards, one set covers the methods of testing of engines and the other covers the specification and performance requirements of both constant speed and variable speed engines.

The standard covering 'Methods of tests for internal combustion engines' is being published in the following 12 parts (each part covering a particular test method or information related to methods of tests):

i) IS : 10000 (Part I) Glossary of terms relating to test methods,

ii) IS : 10000 (Part II) Standard reference conditions,

iii) IS : 10000 (Part III) Measurements for testing, units and limits of accuracy,

iv) IS : 10000 (Part IV) Declarations of power, efficiency, fuel consumption and lubricating oil consumption,

v) IS : 10000 (Part V) Preparation for tests and measurements for wear,

vi) IS : 10000 (Part VI) Recording of test results,

vii) IS : 10000 (Part VII) Governing tests for constant speed engines and selection of engines for use with electrical generators,

viii) IS : 10000 (Part VIII) Performance tests,

ix) IS : 10000 (Part IX) Endurance tests,

x) IS : 10000 (Part X) Tests for smoke levels, limits and corrections for smoke levels for variable speed engines,

xi) IS : 10000 (Part XI) Information required with inquiry or order and information supplied by the manufacturer with the engine, and

xii) IS : 10000 (Part XII) Test certificates.

This standard will be complementary to specifications for performance requirements of different types of engines covered by the following standards:

i) IS : 10001 Specification for performance requirements for constant speed compression ignition (diesel) engines for general purposes (up to 20 kW)

ii) IS : 10002 Specification for performance requirements for constant speed compression ignition (diesel) engines for general purposes (above 20 kW)

iii) IS : 10003 Specification for performance requirements for variable speed compression ignition (diesel) engines for automotive purposes

iv) IS : 10004 Specification for performance requirements for variable speed spark ignition engines for automotive purposes

Spark ignition engines for sprayers and similar applications have been covered by IS : 7347-1974 ' Specification for performance requirements of small size spark ignition engines for sprayers '.

Two stroke spark ignition engines for automotive applications which were earlier covered by IS : 1603 will be covered by a separate specification.

The revised methods of tests covered by IS : 10000 have been aligned with the current international practices in the field of I.C. engines. These parts are in general agreement with the following ISO standards — issued by the International Organization for Standardization:

a) ISO 3046/I-1975 Reciprocating internal combustion engines — Performance: Part I Standard reference conditions and declarations of power, fuel consumption and lubricating oil consumption

b) ISO 3046/II-1977 Reciprocating internal combustion engines — Performance: Part II Test methods

c) ISO 3046/III-1979 Reciprocating internal combustion engines — Performance: Part III Test measurements

d) ISO 2710-1978 Reciprocating internal combustion engines — Vocabulary

IS : 10000 (Part I to Part XII) and IS : 10001, IS : 10002, IS : 10003 and IS : 10004 collectively supersede IS : 1600, IS : 1601, IS : 1602 and IS : 1603.

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